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Prevention of Blindness in a Public Health Program*

C.-E. A. Winslow, D. P. H.

THE sight conservation program, as other public programs, has broadened with the years, and has come to include four major elements: prevention, diagnosis, treatment, and rehabilitation.

WE are concerned today with health, with something much more than keeping out of the clutches of the registrar of vital statistics; and when you look at health from that angle, it is something positive, something definite to be achieved, in the sense of William James's wonderful phrase "simply to live, move, and breathe should be a delight." This is what we mean by health and, from that standpoint, few things could be more important than the task to which you are dedicated here—the prevention of blindness.

The history of the National Society for the Prevention of Blindness goes back a little farther than the official record indicates. I think it can be fairly traced to the creation of a state commission (and how many important things in public health in this country have come out of special commissions created by the State of New York)—a special commission appointed in 1903 under the chairmanship of Dr. F. Park Lewis of Buffalo. It was the report of that commission which fell, in 1907, into the hands of Louisa Lee Schuyler, one of New York City's greatest citizens, and it was largely due to Miss Schuyler's influence and initiative that in 1908 the New York State Committee for the Prevention of Blindness was established. That Committee became the National Committee in 1915, and took the present name of your Society a little later.

* Presented at the thirty-third annual meeting of the National Society for the Prevention of Blindness, December 12, 1947, at the Russell Sage Foundation Building, New York, N. Y.

Its birth as a national committee in 1915 coincided, it is interesting to note, with the creation of the American Board of Ophthalmology—the first of the boards created in this country for the recognition of specialists in particular fields of medicine.

The National Society has had tasks which public health workers such as I can understand quite easily—tasks which are related to the infectious diseases which may cause blindness as well as other tragedies. I suppose perhaps the most outstanding statistical result of the movement you represent has been the control of ophthalmia neonatorum; instead of being the cause of 28 per cent of admissions to children's institutions for the blind this disease can be blamed today for only 3 per cent of such admissions.

But the program has broadened with the passing of the years and comes, as public programs in most other fields have come, to include four major elements—four major lines of attack. If you look over various other programs you find the same things: prevention, diagnosis, treatment, and rehabilitation.

Prevention

You have kept up your work on prevention. For example, in the control of that substantial proportion of blindness, which is still caused by various infections; among children something like 23 per cent of the cases of blindness are even now due to communicable disease. The problems of trachoma, the problems of venereal diseases and of other infections are still an important part of your campaign.

In this field of prevention, too, there is the significant aspect of the prevention of blindness due to control of accidents, particularly in relation to the Society's industrial program, and it has done a notable work in regard to safety in industry.

Hygiene of the eye, consisting largely in the provision of suitable conditions as to illumination, is not as simple a matter to measure. It is not easy to evaluate results. There are data showing the effect of improved illumination on efficiency but we haven't very much that is solid and scientific to show the effect on health. However, I think it can be assumed by anyone who is familiar with the workings of the human body that the performance of tasks which are undertaken under severe strain actually damages the human

organism substantially. I think there can be no doubt at all of that effect. The things we can do to improve light and cut down glare will, I think, count heavily in the future.

This field has been a little confused by different views of certain experts, some of whom believe that the more light you have the better, that the foot-candles should be increased from 20 to 100 and 1,000, if you could get it, and some who are convinced, on psychological grounds, that 30 foot-candles provide an optimum value for school work and to go beyond that value is not only uneconomical but unhygienic.

The American Public Health Association and the Illuminating Engineering Society of America have appointed a joint committee which has been working on the problem, and which, I believe, will promote harmonious and sound standards for our use.

Diagnosis

A second phase of your work is the emphasis on the importance of early diagnosis, and in many eye conditions that is of the greatest importance. This phase of the Society's program is similar to other health programs, such as cancer control, of which we hear so much. The three steps are: (1) periodic screening of the general population or of sections of the general population; (2) eye examinations for those whom the general screening indicates as needing them; and (3) follow-up. Whatever one may think of random X-raying of groups of the population and whatever may be the difference of opinion in regard to a routine health examination on your birthday, no one can doubt the value of screening tests in the field of sight conservation. They are simple, easy and economical, and the results are highly significant.

I think one of the most outstanding contributions of this Society has been the chapter on screening tests, in your book, *Eye Health—A Teaching Handbook for Nurses*. It is extremely helpful to workers in the field.

Treatment

There is no use in finding defects unless they can be treated. I am not sure, from the study of your literature, how far you have gone in this particular field. How far is treatment generally available in

different parts of the country and for different sections of society? That is a problem which, in most public health fields, becomes more or less pressing as soon as screening tests are conducted and as the prevalence of a particular handicap is established and it is unfortunate that, from an economic standpoint, we always find an inverse relation between the prevalence of disease and the availability of care.

A good step has been taken by your Society, I believe, in the employment of a social worker and a public health nurse. But one of the things I think we should like to know in the future is the adequacy or lack of provisions for caring for the conditions which are discovered through screening.

Rehabilitation

The fourth major phase is, of course, the phase of rehabilitation. Once upon a time, when people thought mainly about diseases and not about persons, it was considered that when the acute disease symptoms were over, the doctor's or anybody else's interest ceased. We know today that is not true. We are not interested in sickness. We are interested in sick people, and when sick people cease to be acutely sick they very often remain as social problems. They need time-consuming attention and require costly processes to be restored to normal usefulness and normal satisfaction. We must recognize the real need for the further development of our Social Security program in solving the problems of rehabilitation.

Some High Spots in Sight Conservation History

Now, forgetting this functional classification of prevention, diagnosis, treatment, and rehabilitation, let me say something about the major regions in which your Society has worked, the school and the factory. This organization has given stimulation to what has been called the sight-saving class or the class for the partially seeing. The two first classes were started in Boston and Columbus almost simultaneously in 1913, and there are now more than 600 such classes in existence. But the statistics indicate the need for provision of further educational service of this kind, especially designed for children who have too much vision to be in institutions for the blind, but insufficient vision to attend in regular classrooms.

They need specially equipped classrooms in normal school surroundings.

Indications are that one child in 500 in the school population needs special sight-saving provision, which means that 50,000 children are still lacking this advantage. Attention has been called to the work of your Society in advancing this aspect of sight conservation. Since its early days, it has cooperated in the preparation of teachers for this special work, and has acted as an advisory agency in promoting the establishment of classes throughout the country.

Another aspect of your work has been in industry. It is thirty years now since the first pamphlet on eye hazards was published, the pamphlet on *Eye Hazards in Industrial Occupations* in 1917. Very few people realize the importance of eyesight in industry. They think of eyesight in the abstract, but we have to say "eyesight for what?" All of us can see some things well and other things not so well, and it is often important in industry to have a standard of vision which is far higher, far more rarely attained, than is the case in ordinary activities.

It is not only what we ordinarily think of as central visual acuity or near vision, which is important but, in some tasks, peripheral vision, muscle imbalance, depth perception, accommodation, and color discrimination are equally important in industry. All of these factors may come into a particular industrial task and be of vital importance. The Cheney Company reports 75 per cent of old and 25 per cent of new employees showing visual defects, but of these less than 2 per cent were uncorrectable. This is something that was recognized by almost no industry except a few far-seeing firms until the war came along, and the War Production Board together with your Society stimulated a wider interest.

A study of 283 plants employing 800,000 workers showed 50 per cent with no job analysis for occupational vision, with no attempt to ascertain whether the worker's eyesight was suited for the particular job in hand. This problem has now been attacked by study not only on the part of industry, but by labor as well. The International Ladies Garment Workers Union made a study of 1,704 workers which showed that 51 per cent needed corrected vision.

So there is much still to be done in following the roads this Society has opened up.

I am particularly impressed with the spirit of cooperation which has been mentioned and, as far as I can gather, it is real cooperation. It is not the kind where you "operate" and the other fellow "coos." I sense in the history of this organization a real intent not to blow its own horn and not to insist upon priority, not to insist upon being the sole agency to do various things, but to try selflessly and constructively and in the public interest to work with public health, rehabilitation, medical, nursing and other professional agencies, both official and voluntary, in the pursuit of its purposes of reducing the incidence of blindness and loss of vision.

Your current list has 179 publications ranging from 8-page pamphlets to Resnick's *Eye Hazards in Industry*, a volume of 320 pages, and as one looks down through that list which is classified very helpfully under the headings of items of particular interest to doctors and nurses, and so on, one feels that that list of publications alone is something of which the Society can be very proud.

Future Opportunities

I suspect there are major opportunities approaching for you, some probably in the field of research. Now, research is not something that is just done in the laboratory. There is a very grave danger, I think, that a narrow view of research will prevail. This is a serious hazard in connection with the program for a national science foundation. Why is the world in such difficulties today? I think it is mainly because our knowledge of physical and chemical and medical science has progressed so far ahead of our knowledge of psychological and social science.

Our trouble is that we have learned to make atomic bombs before we have learned to conduct public relations, and researches on public relations are not carried on only with laboratories and guinea pigs. Social science research is conducted with the slide rule and analysis of statistics and through demonstrations. It is carried on in the study of actual social phenomena.

Your Society is concerned with questions such as: Why are 25 per cent of the state schools for the blind unable to furnish medical diagnoses of the causes of blindness of the children in these

schools? In how many instances is the condition such that sight might be restored and the child permitted to attend a regular school? Even when we know the medical cause of blindness, we do not know the factors that brought the condition about. How much of the blindness from cataracts and glaucoma is due to delay on the part of the patient in seeking ophthalmological care, and how much of it is due to delay by an optometrist or by a general practitioner in making proper referral? After the diagnosis is made and treatment proposed, how many postpone treatment so long that the condition becomes so complicated that sight is lost and cannot be restored? The research required to answer these problems is just as much a science as research involving sticking needles into monkeys, and we must recognize that fact in order to render a social service fundamental to the solution of the problems.

It seems to me that we always take too much for granted. I wonder how often you here this afternoon have thought of the problem of the human soul, the human spirit of the blind? Isolated from the world, the human soul is a terribly lonely thing, a terribly useless thing, except in so far as it makes contact with its environment and some 85 per cent of our contact with our environment comes through our eyes. We must consider not only the physical environment surrounding us but the intellectual, social, and historical environment provided by books in which human thought is carried. What a vital thing it is—this contact between the individual and the world in which he lives; and the records of the past and hopes of the future should be kept open to him.

Light and life are synonymous to the poets. You can think of a dozen examples: "Light is the symbol of life!" The *Book of Genesis* says, "And God said, 'Let there be light'; and there was light." And in the gospel of St. Matthew, "The light of the body is the eye." How tremendously significant these things are!

What I like best as an illustration of this problem and the work of this Society is the phrase which you will recall in the dying Goethe's last words, "Light, more light." That is the fine and noble function of this organization, that the people of this United States, that the world, shall have light and more light!

Investigation on Corrective Training of Color Blindness*

Lt. Comdr. Dean Farnsworth

AUTHOR presents the consensus that no cure for congenital color blindness has yet been discovered, basing his conclusions on the findings of the National Bureau of Standards, the Inter-Society Color Council, and the Association of Schools and Colleges of Optometry.

Introduction

The training or coaching of color-blind individuals to pass military color vision tests has for several years been of particular importance to the Navy. Unlike many other services, naval service presupposes normal color vision in its personnel and consequently many naval operations are coded on color. It is bad enough to have a color-blind person in the Navy who knows he is color blind, but it is more dangerous to harbor color-blind men who believe that their vision is now normal because they have been "cured."

Everything that has been said with regard to the Navy is of equal importance in many civilian occupations. Marine, railway, and aviation services operate with colored signals. Industrial and technical tasks are becoming increasingly dependent upon color-coded materials. There are at least six million males in the United States who are partially or completely color blind, many of whom are engaged in transportation, and the arts and crafts of interior decorating, printing, painting, textiles, and color reproduction. It would be of incalculable benefit to these men if it were possible to

* The material in this article is from Color Vision Report No. 15, U. S. Medical Research Department, S/M Base, New London, Connecticut. Opinions or conclusions contained in this report are those of the author. They are not to be construed as necessarily reflecting the views or endorsement of the Navy Department.

remedy or mitigate their color deficiencies. Unfortunately, after seventy-five years of experimentation, no type of treatment or training has proved to be of real value.

The opportunities for coaching became widespread and reached dangerous proportions during World War II. Professional "treatments" were available in almost every town in America. A set of color blind "training" plates was published and sold to the public and placed in libraries for general reference. "Remedies" have been publicized on "science" programs over the radio and the radio scripts were distributed by the sponsors. It is now even possible to take a correspondence course in three easy lessons to enable one to pass whatever tests are used in a given service, with a money-back guarantee. Most of the people who attempted to give color-blindness training were sincere but uninformed in the physiological and psychological aspects of color vision, or believed they had stumbled upon something that would work. Others were probably happy to collect the $25 to $200 fees which were charged for a course.

Some of the methods which have been attempted are: repeated observation of bright colors; subcutaneous injection of iodine; electrical stimulation of the eyeball; warming of one eye; making of color judgments; observation of red and green lights; viewing dazzling lights through red, green, and purple goggles; viewing flashing lights of various colors; dosage with extremely large quantities of vitamins, chiefly various preparations of vitamin A with stress on emulsification; the injection of cobra venom; repeated coaching on pseudo-isochromatic plates or other color-blindness tests; continuous wearing of glasses tinted with the color of the presumed deficiency.

If any of these therapies were in any way useful, the selection sections of the Navy would be vitally interested, for many applicants must be rejected solely because of deficiency of color perception. A controversy has raged in newspapers and magazines and even in scientific journals for some years, but without resolution. The cures became hydra-headed. Since years of proper study are sometimes required to refute an improperly performed experiment, it appeared that there might be no end to the detailed argument. Therefore, it seemed desirable to gather the opinions of the foremost authorities on color vision in America. It will be found that

the consensus is unanimous that no cure for congenital color blindness or mitigation of the deficiency has yet been discovered.

This report was assembled and submitted to committees of the American Medical Association upon their request and that of the Army-Navy OSRD Vision Committee. It has been accepted by the American Medical Association Section on Ophthalmology, the American Ophthalmological Society, the American Committee on Optics and Visual Physiology* and the Association of Schools and Colleges of Optometry.

Report of National Bureau of Standards

The views of the National Bureau of Standards, U. S. Department of Commerce, were requested on the subject of corrective training of color blindness. The following reply was prepared by Dr. Deane B. Judd, Physicist, as of April 7, 1947.

"It is our view that training on any given type of pseudo-isochromatic charts improves the ability to read the same charts markedly, but does not improve color perception at all. The increase in ability to read other pseudo-isochromatic charts of the same type does not in our opinion indicate an increase in color perception; it indicates an increased ability to take advantage of defects of that type of chart. By this view no transfer of this training to viewing situations encountered in occupations on shore and at sea is to be expected.

"What actually happens when an individual having anomalous vision receives training of various kinds is progressive familiarization with the particular type of pseudo-isochromatic chart used to gauge his progress. Possessing, as he does, a slight to vanishing perception of red-green differences, he has some sensory basis for reading the charts, but at least requires long study to make out the numbers, and so fails. Repeated efforts to read the charts create the opportunity for practice and cut down the time required. The practice is more effective if the subject is informed of the correct response either verbally or by the use of selective filters to view the charts. Except for the Dvorine type of instruction, the periods of

* This Committee consists of Drs. Thomas D. Allen, S. Judd Beach, Conrad Berens, Frederick C. Cordes, Alfred Cowan, Walter B. Lancaster, Lawrence T. Post, Avery D. Prangen, and Kenneth Swan.

'treatment' have no effect on the familiarization process, though they distinguish red from green.

"These views are derived partly from our own experimental training of a few individuals with anomalous vision and partly from a study of the literature of the treatment of defects in color vision (about 40 papers since 1870). We deplore the practice of indiscriminate color-vision-test coaching, for that is what we believe the training amounts to; and regard it as a potentially dangerous practice. The following excerpts from a report which we issued in June, 1943, to the Secretary of Commerce are worthy, we believe, of wide publicity:

> ". . . Red-green deficiency, or reduced ability to discriminate any color from those of its neighbors that differ by being redder or greener, is fairly prevalent among healthy men, about 8 per cent having this defect from birth to an important degree. A red-green confuser may fail to notice the color of a red signal, or from a distance may be unable to tell forest land from plowed land. He is, therefore, of secondary usefulness to the armed services.
>
> "The Army and Navy use the so-called 'pseudo-isochromatic chart' form of test to detect red-green confusers. On such a chart colored dots form numbers easily read by a normal observer, but yield different numbers or no numbers at all to a red-green confuser. Failure to pass the pseudo-isochromatic test has barred hundreds of applicants from commissions or from entry into specialized branches of service. Many of them seek help to improve their vision and after two or three weeks' treatment reappear, pass the test, and are admitted. These occurrences have given rise to the belief that a man though red-green blind from birth can still develop a red-green sense from certain drugs, diets or other treatments; but more thorough tests indicate no significant improvement in ability to distinguish red from green. Instead they show that pseudo-isochromatic charts, because of defects probably unavoidable, can be read after several weeks' practice from clues other than red-green vision.
>
> "The development of a test to supplement the convenient but not perfectly reliable pseudo-isochromatic charts, is therefore an urgent need. The lives of a whole crew of a bomber or submarine may be the price to pay for the delusion of one crew member that his color vision is normal just because he took treatments and learned to pass a color-vision test. . . ."

Report of Inter-Society Color Council

The Inter-Society Color Council Subcommittee on Problem No. 11: Color Blindness Studies,* was requested to formulate a statement for transmittal to the American Medical Association, which would express the views of the members on corrective training of color blindness. The following statement was prepared by the subcommittee, approved unanimously, and transmitted through the secretary, Dorothy Nickerson, by direction, on February 28, 1947.

"Whereas, it is generally agreed that in defective color vision confusion of certain colors currently used in signalling, coding, etc., is a common error, and also generally admitted that such confusion may endanger lives and property in peace or war; and whereas during the late war, certain practitioners, some unscrupulous, some well-intentioned but ignorant, under cover of 'corrective training of the color blind' actually coached persons having defective color vision in the color-vision tests used to qualify applicants for military service or for officers' training, we wish to go on record as unconditionally condemning 'corrective training.'

"Reliable scientific evidence indicates that the majority of cases of marked deviation from normal color vision possess some congenital retinal or neural defect, which neither diet nor drugs, nor training in perceptual discrimination can remedy. No crucial rôle in passing the tests in current use is played either by facility in the use of color names, or by degree of familiarity with the various color tones—both stressed by the 'corrective' color trainers. Prolonged study of the color charts of the test, however, enables the applicant to memorize digit series, familiarize himself with certain clues and tricks of composition, or utilize certain aids in viewing. Thus without materially improving his general color ability, he may pass the qualifying test on *retrials*.

* This Subcommittee consists of the following members: Drs. Deane B. Judd of the National Bureau of Standards and LeGrand H. Hardy, Institute of Ophthalmology, Presbyterian Hospital, New York, N. Y., co-chairmen; Forrest Lee Dimmick and Dean Farnsworth of the U. S. Submarine Base, New London, Connecticut; Carl E. Foss, Color Consultant, Princeton, New Jersey; Walter C. Granville, Container Corporation of America, Chicago, Illinois; Elsie Murray, Department of Psychology, Cornell University, Ithaca, New York; Dorothy Nickerson, U. S. Department of Agriculture, Washington, D. C.; Gertrude Rand and M. Catherine Rittler of the Institute of Ophthalmology, New York, N. Y.; and Louise L. Sloan, Wilmer Institute, Baltimore, Maryland.

"In the interest, therefore, both of society, and of the individual, a false rating of whose abilities can in the end work only injury to his prospects, we condemn any training systems of the 'color blind' which claim to be corrective.

"The above comment is not to be construed as discouraging research into the nature of defective color vision. Nor does our censure apply to the possible alleviation or prevention of occasional *acquired* color deficiencies. Care should be exercised, however, in announcing minor success to the press, and thus raising false hopes."

Report of the Association of Schools and Colleges of Optometry

The following resolution was passed June 22, 1947 at Atlantic City, New Jersey, by the Association of Schools and Colleges of Optometry:

"Whereas, the member institutions of the Association of Schools and Colleges of Optometry without exception currently teach that color blindness cannot be cured or alleviated by any method thus far proposed; and whereas, the Inter-Society Color Council has unconditionally condemned so-called corrective training of color-vision defectives; and whereas, the Association of Schools and Colleges of Optometry wishes to announce its stand on this issue, now, therefore be it resolved, that the Association of Schools and Colleges of Optometry heartily concurs in the condemnation above mentioned and urges that optometrists refrain from claiming to be able to alter the physiological mechanism of color vision by any means heretofore advocated for this purpose, and be it further resolved, that the Association of Schools and Colleges of Optometry commends continued investigation of the basis of abnormal color vision but disapproves of the publication of results in non-technical periodicals; and be it further resolved, that this resolution be given wide circulation in the optometric press."

Analysis of Experimental Methods

The major question has now been answered as a whole. An explanation of conflicting interpretations of experimental data may

be found in the following statements* which are selected with the idea of separating various phases of the problem more distinctly.

1. The basic psycho-physiological functions, as indicated by luminosity curves, color mixture ratios, and other stimulus data by which normal or defective color vision is described are unaffected by medicine, training or other therapy.

2. Practice and coaching will undoubtedly enable a color-deficient person to pass, or to show an improved score on, an imperfect test.

3. But there is no well-established proof that training a person to pass a color-blind test contributes to rehabilitation in the true sense of the word, because the skills developed have no practical value except that of defeating the purpose of the screening test.

4. The only aspect of color blindness that can probably be modified by training methods is the ability to differentiate chromas, and the tests used for measuring improvements should concentrate on this aspect of the problem.

5. Improvement measured by such means could not be interpreted as a claim to have made changes in the other and more basic aspects of color blindness.

6. A program formulated on these principles would also be of value in training persons with normal color vision to achieve a finer discrimination of colors.

Conclusion

The opinions of nearly every authority on color vision in America are represented in the above communications. They indicate that the best informed and most experienced specialists in the field of color vision are emphatically of the belief that congenital color deficiency cannot be remedied by the use of diet, medicine, training, or other treatment now known to science.

* Points 3, 4, 5, and 6 are in the words of Glenn A. Fry, Director, School of Optometry, Ohio State University, from "Rehabilitation of the Color Blind," *Michigan Optometrist*, November, 1943.

Social Service in an Eye Clinic and Its Relationship to Community Agencies

Eunice W. Wilson

DISCUSSES function of social service, medical social casework, children in surgery, teaching and research, relationship with other agencies, and presents several case illustrations.

Function of a Social Service Department

The function of a medical social service department is influenced to a large extent by the purpose and function of the agency within which it operates. In an eye clinic or eye hospital the primary purpose of the agency is to provide medical treatment to individuals with eye diseases or eye abnormalities. In addition to providing care for the individual patient, an ophthalmological service is also usually concerned with the teaching of ophthalmology to resident physicians, medical students, student nurses, medical social workers, occupational therapists, and others. It also carries on research as to causes of blindness and new methods in ophthalmological treatment. These three functions of an ophthalmological service—treatment, teaching, and research—are all part of a broad fourth function which is prevention of blindness, carried out by treatment of the patient, education of professional personnel, and the advancement of science.

The social service department in a clinic with these responsibilities has social responsibilities of the same general nature. The primary concern of the medical social worker, as of the ophthalmologist, is the care of the individual patient; but members of the social service staff also participate in teaching the social implications of eye diseases and the community resources which are available for the use of patients, to medical social students, student nurses, and resident physicians. The social service department also

has a responsibility to promote studies and research projects in its own field which will further knowledge on social problems peculiar to a specialized hospital or clinic and which will improve methods of social treatment. The medical social caseworker in the clinic, as the doctor in the clinic, is thus through all of her activities contributing to prevention of blindness by social treatment, by education, and by research in a limited way.

The responsibilities of a social service department are carried out by medical social caseworkers. It is their function to provide the social treatment which will enable the patient to accept, insofar as he is able, the prescribed medical treatment or to face whatever disability or physical limitations he may have, either temporarily or permanently, as a result of his ophthalmological condition. The caseworker is specifically trained for this type of service, just as the doctor and the nurse are trained for medical and nursing service. The fully qualified medical social caseworker at present requires four years of college education, plus two years of graduate training and a master's degree from a recognized school of social work. The graduate training consists not only of academic instruction in regard to illness, social conditions, the dynamics of human behavior and principles of community organization, but also includes the actual practice of social treatment in a medical agency under the guidance of an experienced medical social worker. Since the ability of the medical social caseworker is important in social treatment, her preparation is mentioned here for purposes of clarity, as her functions in a clinic setting are discussed.

Medical Social Casework

Medical social treatment or medical social casework is concerned with any obstacles in the patient's environment, in his attitudes or both, which are preventing the patient from seeing a solution to his problem. Casework involves far more than giving advice or suggesting resources; it is a process through which the caseworker and the patient take joint responsibility for understanding the patient's difficulties and for finding a way by which he can take constructive action in regard to them. Social treatment may be fairly simple, direct, and limited to a single phase of a patient's problem; or it may be a more complex, continuing process, which necessitates a

more indirect approach and a more prolonged service. Both the brief and more comprehensive services require the same basic understanding of the patient, of his attitude toward his medical condition and of ways in which he can use assistance. Since casework training emphasizes the individualization of a patient and the desirability of a patient's handling his own problems insofar as he is able, the social caseworker in an authoritative setting has a relationship with the patient which differs from that of other clinic personnel. In many diagnoses it is possible for the doctor to make specific recommendations for the medical treatment necessary to alleviate a patient's symptoms, on the basis of scientific objective information. The caseworker, however, must take into account the factors within the patient which cause him to resist or reject medical recommendations. She, necessarily, deals with the patient's subjective reactions and attempts to do so in a way which is constructive to the patient medically and satisfactory to him emotionally.

Through years of experience the social casework field has demonstrated that techniques of persuasion and coercion are of little value in securing a patient's wholehearted cooperation in medical treatment. Patients who have been persuaded to go to sanatoria for tuberculosis, without having settled to their own satisfaction their ability to lead a restricted life, or to give up their work, are examples of patients who are later "discharged against advice" or considered "uncooperative." Thus the caseworker in an eye hospital, although she realizes that a patient with a detached retina should be admitted for operation immediately for the best surgical results, also knows that if the patient cannot come into the hospital ward with some serenity of mind about his job and his family affairs, he may become so anxious that he will leave the hospital before surgery is performed and may never return for treatment.

Case Illustrations

The following case material illustrates the social treatment in (1) a rather simple situation; and (2) a more involved situation:

1. Mr. A, a 41-year-old man from a neighboring state, with chronic glaucoma of both eyes, was referred to Social Service because he was reluctant to come into the hospital for operation.

The patient was a single man, with no relatives, living in a rooming house, and regularly employed. He belonged to a labor union which had hospital insurance to cover hospital expenses. He expressed his reason for opposing surgery as follows: he had been advised by a local doctor in his community that he should never submit to surgery if he wished to retain his vision. In the caseworker's judgment the patient felt quite alone in making a decision about operation and was afraid to go against the advice of his local doctor. She, therefore, gave him ample opportunity to discuss his objections to entering the hospital. He expressed a desire to return home before making his decision.

The urgency of operation, as advised by the clinic doctor, was pointed out and it was suggested he might like to telephone his local doctor and also his employer for their advice, in view of the recommendation. Patient quickly agreed to this and called his employer first. The employer urged him to follow the advice of the clinic but agreed to call patient's local doctor for his opinion. He did so and telephoned to tell the patient that his doctor agreed that he should follow the advice of the hospital. In the meantime, with the patient's permission, the caseworker had telephoned a friend who had originally suggested he come to the hospital. She explained the patient's uncertainty about staying in the hospital and the friend came to the hospital to discuss it with him. After this discussion the patient decided to remain and the friend stayed with him until he was admitted to the ward. As the patient's employer and friend gave him encouragement regarding surgery, he became less apprehensive and seemed confident in his decision and went through his hospitalization easily.

In this situation the caseworker was aware of the patient's need for help in making a decision and of his need to have someone share with him the failure of surgery if that should occur. She recognized his concern about unemployment since he had no family on whom he could depend and suggested his employer as a resource to whom he might turn as she thought he might fear loss of his job if the employer was not consulted. She did not urge the patient to comply with the recommendations other than to reiterate the doctor's statement of the urgency for surgery, but she did open up ways for the patient to use his own activity to determine his decision with people whose opinions he could trust.

2. Mr. D, a 62-year-old man, was seen in the clinic, with a diagnosis of toxic amblyopia. His vision was 1/200 right eye and 3/200 left eye. He was referred to the social worker to discuss his

discontinuance of alcohol and tobacco. At that time he was drinking a great deal of whisky, and smoking constantly. The patient was a quiet, reserved man of good education, who had had responsible positions as a bookkeeper but had lost his last position some months previously due to his age and a reorganization in his firm. At the time of referral he was working a few days a week as a guard in a gallery where art treasures were stored and on display. He expressed dissatisfaction with this employment because it did not provide sufficient income for his needs.

In interviewing the patient the caseworker expressed her interest in helping him to improve his vision, holding out hope that it could be improved if he could follow medical directions about reducing his consumption of alcohol and tobacco and having a more adequate diet. She asked if he thought he could carry out the recommendations. She gave him some interpretation of the cause of his condition and indicated there was little that the doctor could offer in treatment unless the patient could control his habits, but also pointed out that she was there to help him see how this could be done. The patient stated that he wished very much to have his vision restored, but questioned how he could get along without alcohol and tobacco as they were practically his only pleasures in life. He related that he lived in a room alone, had no friends, and was estranged from his family. He had been separated from his wife some years before, and had begun to drink more heavily after his separation. He had a daughter who was married, with one child, and expressed great interest both in his daughter and grandchild, but stated he had little to do with them as he was not able financially to take gifts to his grandchild, nor do any of the things which a father and grandfather should do. He spoke of strong feelings of depression which swept over him at intervals. He could not account for the cause of these episodes but when they occurred he knew of no way to handle them except through drinking or walking. He described how he often walked for hours at a time to become fatigued enough to sleep. He had had periods of depression for some years but of late they had become more frequent and he was in constant fear when he was free from one that another would occur.

His discussion of these periods of depression indicated to the caseworker that his problem was probably a fairly serious one. He also presented a picture of a man shut off from his family, unable to make friends and undoubtedly without sufficient funds. When the suggestion was made that he might have help with funds for an adequate diet, he politely but firmly refused to consider assistance of any kind. His only concern was to have a job which paid him more money. He was unable to pay for vitamins ordered in the clinic and it was some time before he was willing to accept those as part of the hospital's free service.

The caseworker believed in this instance that the patient could not control his habits by his own efforts. She discussed this with the ophthalmologist and asked if he thought a psychiatric consultation might help evalute the causes of the patient's depression which seemed to be a larger factor in his drinking. The doctor approved of this plan and a psychiatric consultation was arranged. Since the psychiatrist believed the patient was highly intelligent, anxious for help, and that he would respond to psychotherapy, he was accepted for regular treatment. At the same time he was seen regularly in the Eye Clinic and also by the caseworker. The psychiatrist dealt with the patient's personality adjustment to his separation from his wife, his emotional loss of his daughter, and his concern about his advancing age and loneliness. The caseworker saw the patient on the basis of a consistently interested individual, who had faith in his efforts to follow recommendations. She stood ready constantly to offer material aid if and when the patient wished to accept it. She respected his desire for independence and did not urge him to use resources which were threatening to it, as this sense of independence was one of the few ideals in his life that he had been able to maintain. After a time he became able to accept a toy from the caseworker, occasionally, which he could give to his grandchild and, under psychiatric treatment, he began to resume visits to his daughter's home and to spend a part of each Sunday and holiday with her. No effort was made to see his daughter nor to interpret his situation to her, as again the caseworker believed that to do so would indicate to the patient his inability to be responsible for himself and his affairs. He discussed with her various problems which arose regarding his employment, his living arrangements, and renewal of a few friends and his strengthening family ties. Thus the caseworker was dealing directly with his reality situation and his feeling about it, while the psychiatrist treated his underlying personality problems.

The caseworker here integrated the entire medical treatment process by interpreting to the ophthalmologist, early in treatment, the patient's problem as she saw it and taking the initiative in suggesting that the patient's problems required more help than could be offered by casework alone. She kept the ophthalmological and psychiatric care combined as far as the patient was concerned so

that he saw it all directed toward regaining his vision. She indicated to the ophthalmologist when the restrictions in regard to alcohol and tobacco were more strenuous than the psychiatrist thought the patient could bear in order that he might not become too discouraged and withdraw from treatment entirely. She requested the ophthalmologist to give the patient realistic encouragement about improvement in his vision as it occurred in order that the patient might see tangible results of his cooperation.

At the end of ten months the patient's vision had improved to 20/40 in both eyes. Improved vision enabled him to secure a position which permitted him to live under less restricted economic conditions. He is now having two pipes of tobacco per day, but no alcohol, and is seeing the psychiatrist only at infrequent intervals. Ophthalmologically his treatment is completed. It is extremely doubtful that this patient could have followed the medical recommendation to discontinue alcohol and tobacco without the social and psychiatric treatment which took into account the type of help the patient could use. In this instance there was no use of outside community resources, and treatment was effected almost entirely by the use of the combined skills of the doctor, psychiatrist and caseworker.

Children and Eye Surgery

While discussing social treatment some of the types of medical social problems found in an Eye Clinic should be mentioned. Considerable apprehension is usually present in patients with serious eye difficulties, who have a fear of surgery and a general underlying fear of blindness. Much of the anxiety is not expressed verbally and its significance may be minimized by medical and nursing personnel, since they are not as specifically trained as the caseworker to be acutely aware of types of behavior which are signals of anxiety and fear. Most children on the ward of an eye service are admitted for surgical procedures. Many of the children have neither been separated from their parents nor hospitalized previously. They are thrust into a strange environment, among strange people, and have little understanding of what is to happen to them. They are lonely and fearful. It is difficult even for adults to have their eyes bandaged following surgery, knowing that it is even only a tempo-

rary inconvenience. The child, however, is less able to evaluate whether his bandages are permanent or temporary. If he has to have an enucleation he may believe this is being done without his parents' knowledge and consent unless the parents have prepared him for the procedure or can be with him soon after the operation to reassure him about it. The fact that a child is told he is to have his eye removed and that he will be given another, often means to the child that he will see with the prosthesis.

The caseworker who knows a child before his admission can be helpful in making the hospitalization less disturbing to him. She can allay some of his fears in regard to treatment procedures by explaining just what will be done, why it is being done, and how much discomfort he can expect. She can explain the hospital routine and regulations to the parents, and encourage them to prepare the child for the treatment procedures. Gifts and regular letters from the parent may be suggested in order that the child may know his parents have not forgotten him and will take him home as soon as his medical condition permits. Personal messages to keep the child closely in touch with his family group during hospitalization are important, since visiting hours are usually very restricted for children.

An example of how a child can use hospital care as a helpful rather than a punishing experience is illustrated as follows:

Jane, a four-year-old child, was admitted for treatment following an injury to one eye from falling on a pair of scissors. She was originally referred to the caseworker in the eye clinic because enucleation of the eye was being considered and the doctor thought her father was quite distressed by the recommendation. Following an interview with the social worker the father decided to have the child admitted. When she was referred to the pediatrician he reported that she had resisted examination violently. On the day following admission to the ward the head nurse called the caseworker to report that patient was refusing every attempt at either examination or treatment, even to having her pulse taken. The nurse requested that the patient's father be asked to come to the hospital to see if he could secure the patient's cooperation. It was hoped that enucleation might be avoided if the danger of sympathetic ophthalmia in the uninjured eye did not become too great. The nurse pointed out that the patient was "whiny and spoiled" and it was evident that she was causing great annoyance in the

ward. The resident doctor when consulted stated the child was thoroughly spoiled and needed to be severely disciplined. Her behavior made it impossible to determine her ophthalmological condition accurately. Arrangements were made for the father to talk with the doctor and visit the patient. Although the father expected he could persuade the patient to cooperate if he had a few minutes alone with her, he spent almost two hours with no success. He was present when an attempt was made to take her temperature when she became extremely upset, trembled, perspired profusely, and cried hysterically. In spite of all types of reassurance it was necessary to hold the patient by force to have her temperature taken.

The caseworker, from observation of the child and from her talk with the father, thought patient was immature for her age and that much of her behavior was babyish. She also saw indications from patient's conversation that she was disturbed not only about her eye injury, but also by the fact that her mother and father did not live together and that they quarrelled when they saw each other. In interviewing the father it was learned that the parents were divorced and patient lived with her father and a housekeeper but the mother still visited the home. Frequently violent quarrels and physical antagonism were displayed between the parents which the child had witnessed. The mother was blaming the father for patient's accident and threatening to try to obtain custody of the child if enucleation became necessary. It was evident from the history that the child had little security in her home life, and that she, undoubtedly, was divided in her loyalties between her mother and father. The father showed fear of losing the child and was giving her extravagant presents and pampering her in numerous ways to try to cement her affection for him. The father reported that patient had had two other accidents since the divorce, a severe laceration of the hand and a fractured clavicle. From her past experiences he felt she had reason to be fearful of pain from doctors. She had never been in a hospital before.

In view of the fact that the patient seemed to have so little emotional security in her home setting, the caseworker anticipated that her adjustment in a strange environment with many unknown persons would be difficult. She, therefore, decided to attempt to establish her relationship with the patient as a friend whom she could trust and to prepare the child for further medical treatment by giving her factual information about her need to be in the hospital and the necessity for her cooperation with the doctor. Since attendants on the ward were scolding the patient for crying and saying that no one would like her if she continued to behave so badly, the caseworker suggested to the head nurse that the child

had a real fear of doctors and that if she could be allowed to be somewhat babyish and spoiled without disapproval, she might come to feel secure in the hospital and relax enough to permit the doctor to examine her. She also explained that she believed the patient felt she was being blamed for her accident and that any disciplinary measures taken would be interpreted by her as punishment.

The caseworker visited the patient regularly, several times per day, talking with her and showing patient that she was interested in her. She explained that she knew the patient was afraid of the doctor, that she knew it was hard for her to have the examinations, but she constantly repeated that everything was being done to help her get well. She answered the patient's repeated questions about why the flashlight was used to examine her eye, the reason for drops, and the necessity for taking her temperature. During these visits the caseworker gained considerable knowledge of the child's fears and anxieties from her comments and behavior in directed play activity. Although she grew more friendly to the caseworker daily, she continued to be terrified if anyone approached her with medicine or instruments for tests. For the first five days practically all examinations had to be done with patient either held forcibly or wrapped in a blanket. On the sixth day of hospitalization, however, she announced to the caseworker that she had allowed the doctor to examine her. She was given praise for this progress and also given a tangible reward. About this time she also began to be interested in ward activities and her behavior began to improve. The nurses and attendants commented upon the change.

On the tenth day of hospitalization, with great effort and control, the patient allowed a visiting ophthalmologist, whom she had never seen before, to examine her. The decision was made at this time to enucleate the injured eye without delay. The caseworker had little opportunity, therefore, to talk with the patient about the surgery or prepare her for the experience, but she did explain that her eye was not better and the doctor would have to operate in order that she might get well and go home. The doctor arranged for the caseworker to remain with patient until she had taken the anesthetic.

Following operation the patient's behavior improved tremendously. She became independent and outgoing in her relationships to the other children on the ward and to the nurses. When her bandages were first removed the caseworker stayed with her and she did not show unusual disturbance. Later she was able to have the sutures removed without ether, although the doctor had not thought this would be possible. When the patient was discharged the recommendation for a prosthesis in from 6 to 12 months was made as it was not anticipated that she could be fitted sooner in

view of her fear of treatment of any kind. However, on a visit to the caseworker's office about three weeks after one postoperative clinic examination she asked if she would have a new eye. The caseworker asked if she would like to see what a new eye would be like. She said she would and a prosthesis was brought in for her to see. She examined it with interest and held it up to the socket. It was then explained that she would not be able to see with it but she said she would like one anyway as it looked so much like her real eye. On her next clinic examination, one week later, she asked the doctor when she could buy an eye and he decided that she was responding so well to clinic examinations, with none of her previous resistance, that she could probably have the prosthesis fitted. The caseworker prepared the optical company that she might be apprehensive when the fitting actually took place and they agreed to make more than one appointment if she seemed anxious on her first visit. Two weeks later the father telephoned that patient was wearing her prosthesis successfully.

The social treatment with this child was directed toward relieving her fears of the hospital setting and medical treatment. This was accomplished by direct treatment of the child by the caseworker and by interpretation of the child to the medical and nursing personnel responsible for her medical care. Social treatment of the child consisted first in establishing her confidence in the caseworker; second, in encouraging her to express her fears and distrust of hospitals and doctors in words and play in order that she might be given explanation about procedures and reassurance that every examination and treatment were given her to help her get well. This reassurance could not be accepted by the child until she could really trust the person who gave it. To secure this trust it was necessary to understand the child and the reasons for her behavior, see the situation as she saw it, and to talk with her in a way the child could understand—that is, on her own level. The caseworker through her understanding of the dynamics of the child's behavior was able to interpret it to the other personnel concerned with the patient's care. Through this interpretation the handling of the child was influenced. The attitude of discipline was changed to one of understanding, with the result of slow but steady progress in the child's ability to cooperate in treatment. Her trust in one person carried over to other personnel and, eventually, to the doctor.

In the clinic the ophthalmologist usually refers the children with

reduced vision to the social service department if special educational plans are indicated. Recommendations are made in terms of the ophthalmological condition and consideration is also given to the total child insofar as information about him is available. Segregation in special classes is not generally advocated on the basis of vision alone. Some children with 20/70 vision may be definitely in need of the visual aid they can receive in a sight conservation class. Other children with this amount of vision may be doing well in the regular classroom, and a proposed change to another class would be recommended only if specifically indicated on the basis of some medical, emotional, or educational need.

The Glaucoma Patient

Most social service departments in an eye clinic take a definite responsibility for prevention of blindness in a way which combines social treatment with a more specific method of keeping patients under medical treatment. This is illustrated in many eye clinics with glaucoma patients where consistent medical supervision is so important to conserve vision. At the Massachusetts Eye and Ear Infirmary there are more than 1,500 patients being actively treated for glaucoma, with an average of more than 30 new glaucoma patients per month. The doctors refer all of these patients at the time of diagnosis for an interview with the social worker to see (1) whether the patient is fully aware of the diagnosis and its implications; (2) whether he understands the necessity for regular clinic visits; (3) whether the purpose of continued medication is clear; (4) whether there are any real obstacles to keeping clinic appointments such as inability to pay for care, transportation difficulties, or low vision; and (5) whether the patient is confronted with emotional problems which may have a tendency either to increase his symptoms or retard his treatment. The caseworker deals with the problems presented in any of these areas. In addition she attempts to have the patient's family understand the seriousness and the chronicity of the disease in order that they may support him in following recommendations. A written pamphlet on glaucoma is used as part of the patient's education regarding the diagnosis when the caseworker believes the patient can understand its purpose and use it constructively. In addition to the social

worker's efforts, a follow-up program is carried out as part of the prevention of blindness program. A secretary handles the mechanics of the follow-up. If a patient becomes delinquent in keeping appointments the follow-up secretary refers the patient to the social worker for further service. Here, as in her contacts with other patients, the caseworker has a responsibility to be sure that the patient is not failing to come for treatment for reasons which can be handled, by interpretation, relief of fear, or by manipulation of environmental factors. There are many serious social problems presented by the patient with glaucoma. The problems are varied, as in other diagnoses, according to the meaning the diagnosis has for the patient. In all cases, however, the patients need to sense the interest of the clinic in them as individuals if they are to continue treatment. Because many of them are in the advanced age group, repeated medical interpretation and reassurance are necessary.

A large social problem in an eye clinic is the adjustment of a patient to permanent loss of vision. To face blindness and the physical dependency which accompanies it, is an experience of great psychological and social significance to the patient and to his family. While the problem of blindness does not belong primarily to an eye clinic, the caseworker there must deal with it frequently because it is in the hospital setting that the fact usually first becomes known and it is there the patient has his immediate emotional reaction to the knowledge. The caseworker's knowledge of the patient's capacity for facing reality and her estimate of his emotional stability can be of value to the ophthalmologist in determining the appropriate time to tell the patient that his vision cannot be restored or improved. When the patient has been given this information the caseworker must be ready to offer whatever service is indicated. Many patients cannot accept services from an agency for the blind immediately as they retain hope that a cure will be found for their condition or that sight will eventually improve. During this period of fear that blindness is permanent and hope that vision will in some way be restored, the caseworker carries a major responsibility with her activities consistently directed toward enabling the patient to come to a real acceptance of his situation and to take positive action in relation to it by using the services of an agency for the blind and other community

resources for retraining, education, employment, or financial aid. The social service department in an eye clinic is often the agent through which the ophthalmologist makes his referrals to an agency for the blind. The caseworker in those cases gives the patient a general idea of the types of service offered by the agency for the blind and sends to the agency available medical and social material which is pertinent in planning with the patient for his future.

Function of Social Service in Teaching

The second major function of the social service department, teaching, does not need to be elaborated upon here, as the methods by which it is done in different settings are widely varied. The important thing to mention is that it should be incorporated into any social service program in order that understanding of the social implications of eye conditions may reach as many groups as possible, both within the hospital setting and in the community. All possible effort should be made to acquaint social work personnel in nonmedical agencies with eye diseases and the services offered by an eye hospital for their relief. This may be done in numerous ways, *e.g.* lectures, institutes on medical information, pamphlets describing eye diseases and the need for treatment, and by participation of ophthalmologists and prevention of blindness workers in educational programs and social work conferences.

Social Research

In social research the contribution made by social service departments is limited in spite of the vast amount of social material available. However, some effort is made through studies developed by medical social students as part of their training, and, since a research worker is not usually available on a staff, opportunity is given when possible for a member of the staff to study a new problem as it arises or to evaluate methods used with old problems. At the Massachusetts Eye and Ear Infirmary, within the past six years, there has been a great increase in the number of infants blind because of retrolental fibroplasia. This problem increased so rapidly and created such serious problems with the mothers of these children that a caseworker was relieved from her regular duties to study the type of help the parents needed and could use. As a

result, the problems with which the mothers can use help have been clarified and different methods have been tried quite consciously to meet them, both by group and individual social treatment. Educational instruction of the mothers on methods of training the children is being provided by the employment of a trained nursery school teacher under the direction of the social service department, who relates her services very directly to the social treatment of the mother and child. Home care of the child and his participation with children with normal vision have been emphasized.

Relationship with Other Agencies

The material already presented indicates in many places how the services of other agencies relate to service in the clinic. A large number of patients who come to the hospital are referred by social agencies which already know their particular personality traits or their family problems which may be very important in both diagnosis and medical treatment. Social strains which have necessitated the services of community social agencies may be increased when illness is present. Some knowledge by the hospital of such social situations, early in any patient's treatment, results in a more adequate and comprehensive service to the patient.

Caseworkers in agencies dealing with the aged can be extremely helpful to the patient and his care. They can prepare the cataract patient or the patient with glaucoma for his hospital experience. Many elderly people, as well as children, become confused with both eyes bandaged and find it difficult to keep personalities identified by voice only. They may become disoriented and develop a temporary psychosis. If the caseworker who knows the elderly patient can prepare him for what cataract surgery involves, can visit him in the hospital and assure him that he will be taken care of during his convalescence, the hospital experience may be much more easily tolerated. The caseworker needs also to prepare him for the fact that his vision will not be improved immediately following operation. If the patient realizes it will be six weeks after operation before he will be refracted for cataract glasses, he will not be so apprehensive that the operation was not successful. The social worker in the local agency may not feel equipped to deal with

these explanations; if not, the caseworker in the clinic stands ready to give such help if she is aware of the patient. However, in a clinic where from 150 to 200 patients are seen in one day, there is little opportunity for the caseworker to be aware of all of the patients who may need her assistance unless they are called to her attention.

The relationship between the social worker in the clinic and the social worker in another agency is often one of consultation and information, to give the hospital understanding of the patient's total social situation and to inform the social agency of the patient's medical condition in order that intelligent planning may be effected. In some instances the relationship may be more complicated and there may be differences of opinion between agencies as to the best solution for a patient's problem. In such cases full discussion between the social workers concerned and real understanding of the goal each is trying to accomplish is essential if services are to be coordinated for the patient's best interests. The goal of the patient and his desires take precedent over those of the agencies trying to serve him.

It is the function of the social service department in a hospital to reach out to any agency in the community which may have a service to offer in relation to a particular patient's need and to determine when another agency can be more helpful than the medical social worker within the hospital setting. The medical social worker has definite responsibilities for problems directly related to the patient's medical care or rehabilitation but social problems unrelated to such care are primarily the province of other agencies.

Social workers in every type of agency are in touch with patients who may need ophthalmological treatment. The community agencies and hospitals must work together, and make their contributions if patients with eye difficulties are to receive the medical service best adapted to their individual needs.

Illumination and Color in Industry*

Faber Birren

GOOD vision demands ample light and proper brightness contrast, the latter being made possible through the coordination of light and color.

THIS is meant to be a practical story, based more on a summary of actual experience in industry than on theoretical premise. In recent years illumination and color have been extensively and intensively studied by ophthalmologists, lighting authorities and color specialists. Unfortunately much of the literature thus developed has been bewildering and even contradictory. In many instances, an awkward terminology has defied a clear understanding by others. Some authorities, with instruments and meters in their hands, have attempted to draw conclusions that disregard physiological and psychological factors. Illumination has been confused with brightness—and both with the anomalies of vision. Because of all this, the practical specification of illumination and color in industry has been difficult, controversial, and beset by statements of principle that seem to run in cross directions.

It should be understood at the outset that light and illumination are meaningless except as they are reflected or transmitted into the human eye. In the stratosphere the sky is black. Too much of illuminating engineering overlooks the fact that one or a thousand foot-candles mean little or nothing until such energy is converted into brightness and thus perceived.

Again, brightness holds advantage over darkness in the action of seeing. Not only does it stimulate the retina and regulate the

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pupil opening, but it is psychologically more compelling. Yet while high brightnesses may add efficiency to illumination, they are not always desirable. Under some conditions they may interfere with the seeing task and handicap vision. Low brightnesses, incidentally, are the general rule in nature.

Today, one basic fact seems to be universally agreed upon—"that a human being sees best and visual fatigue is reduced to a minimum when the entire field of view is of approximately the same luminosity as that to which the fovea is adapted." (Parry Moon.) Thus an orderly discussion of recommended practice in the use of illumination and color may be set off to a good start. Where luminosities are not uniform and where severe contrasts exist within the field of view, vision may be taxed and glare conditions may be present.

If I understand rightly, most of the discomfort associated with so-called eyestrain is due more to efforts at accommodation, muscular imbalance and the like rather than to overstimulation of the retina. The human eye can look alternately at moderately high brightness and low brightness without undue discomfort and strain, if in each instance the whole field of vision is involved. However, if high brightness and low brightness exist in the *same* field of view, and if they must be concurrently rather than alternately accepted by the eye, trouble will set in and vision will be inimically affected.

In the consideration of any lighting system, exposed light bulbs or rows of fluorescent tubes or opalescent globes should obviously be avoided. Some illuminating engineers can quote actual figures for the upper limits of surface brightness in lighting fixtures. Such figures are not particularly needed, and they may be misleading. The requirements of a lighting system are very obvious and very simple—uniformity as against "spotty" contrast.

Illuminating engineers have argued at length for and against direct and indirect lighting systems. In my own experience in hundreds of industrial plants throughout the country, I have found both systems ideal—not one better than the other, but each highly satisfactory under certain conditions. Lighting authorities seem to favor the direct system because it will deliver more foot-candles upon average working areas. Ophthalmologists often favor the in-

direct system because it effects a softer and more even distribution of light (and not so many foot-candles).

To go back to the basic principle that the eye sees best where luminosity is uniform, there is unquestionably a vast difference between intensity of light and the ability to see clearly. If a lighting system is such that it exposes the eye to great extremes in light and dark (possibly bright overhead fixtures and dark floors and equipment), constant pupillary adjustments will necessitate a lot of light on the task itself for the eye to "fight" its way through the extremes. However, if uniformity of brightness is apparent—and eye adjustments unnecessary—the eye can actually see better and more clearly under relatively dim light (foot-candles to the contrary).

The indirect lighting system is desirable and appropriate in offices, for example, and is almost always psychologically appealing. The best type of fixture is one with an opalescent bowl or reflector which will transmit an intensity of light that approximately matches the brightness reflected by the ceiling—thus blending fixture and ceiling into one relatively uniform area. Such fixtures are made both for incandescent and fluorescent sources. Indirect light (semi-indirect in the above instance) seems to be "easy" on the eyes. It effectively reduces shadows and specular reflections. The room appears "cheerful," lacking in harshness, and vision may operate efficiently under foot-candle levels which many a lighting authority would disparage.

However, where floors or equipment may be unusually dark, the ceiling overhead in the indirect lighting system may become a glare source. This is no fault of the system. By using lighter colors on floors, desks, furnishings, more uniformity will be realized (and more foot-candles because of multiple reflections). The system will be at its best.

Indirect lighting systems (at least in my experience) are the safest of all to assure visual comfort. They are not efficient from the lighting standpoint, for the mere fact that the bulbs or tubes are concealed and light distribution must depend chiefly upon reflectance. Turn the reflectors around, expose the bulbs or tubes, and foot-candle readings will jump up—but visual efficiency may simultaneously collapse.

Hence the direct lighting system requires expert care and

engineering. In industrial plants having monitors, high bays or exceedingly high ceilings, this method of illumination is generally the only practical one. In certain machine operations it holds the added advantage of giving form and shape to materials or products. (Indirect light tends to "wash out" highlights and shadows.)

The fault with many direct lighting systems is that the eye is too frequently exposed to "naked" bulbs or tubes. They may stand out in marked contrast with a dark ceiling or overhead, thus raising havoc with the principle of uniformity. The conventional type of RLM reflector is often inadequate. By introducing deeper shields or reflectors, baffles, diffusing lenses and the like, glare may be reduced and the eye less bothered. Where the reflectors are near the ceiling, they should also be painted white on top to blend with the overhead. Obviously, machines and floors should be as light as possible both to reflect more light and to reduce brightness differences.

Further, where the task may demand critical use of the eyes to distinguish fine details, supplementary light sources (over and above the direct or indirect lighting system) may be necessary. Some tasks require a lot of light. Yet, as ever, the surroundings should be kept as uniform as possible in brightness.

As to spectral quality (color) in light, a yellowish tint—natural to incandescent bulbs—is excellent. In fluorescent tubes, the so-called 3,500° tube is superior to the "daylight" tube for general room lighting. "Daylight" illumination, in fact, has been found definitely objectionable, except where accurate color discrimination is required. Its bluish quality tends to "blur" the visibility of objects; it is "cold"; and it has a very unflattering effect upon human complexion (which may lead to a neurotic form of "eye-strain" among women).

"A visual task is inseparable from its environment." Thus a proper control of illumination must be supplemented by a careful regard for the use of color in the painting of ceilings, walls, equipment and machines. Luckiesh has written: "The general absence of controlled backgrounds for seeing and lack of consideration of them are simple illustrations as well as eloquent testimonials of the general absence of a consciousness and knowledge of the factors which influence seeing."

Industry sorely needs good eyesight. The correction of visual

defects becomes a mere locking of the barn door until ophthalmologists comprehend that bad conditions often cause discomfort—and these conditions must be righted at their source within the industrial plant or office.

Because the human eye needs light to see, and because the process of vision depends almost wholly upon reflectance, the matter of color and brightness is all-important. The statement has been made that it is just as easy to see a strand of *white* thread on a black background under one foot-candle of light as it is to see a strand of *black* thread on a black background under two thousand foot-candles. "Seeing is not a matter of looking at light waves as such, but of looking at external things mediated by these waves; the eye has to instruct us, not about the intensity or quality of the light coming from external objects at any one time, but about these objects themselves." (Ewald Hering.) Thus while vision is dependent upon light, perception itself seems to be curiously independent. As a matter of fact, illumination is "seen" almost entirely in terms of the appearance of objects in the field of view. If light sources were concealed, a room painted a dull black would appear dark regardless of the volume of foot-candles showered upon it.

In my opinion, illumination is too often given an unreasonable amount of attention in factory design—at the sacrifice of a sensible attitude in the application of color. Lighting systems designed to double or triple the volume of illumination within an interior very often lead to serious complaints and to a drop in human efficiency and production. At the same time, lighting is easily overdone. Any eye specialist has reason to be skeptical about contentions that certain tasks require a certain intensity of foot-candles. They do and they don't, depending on the relative distribution of brightnesses within the field of view, degree of contrast, visibility and a dozen other factors.

However, to draw upon my own experience and to suggest how color and brightness specifications may be intelligently written, let me set forth a series of elementary principles and simple observations.

For the most part, uniform luminosity in the field of view may be said to be tolerable where brightness ratios do not exceed 1 to 10. The task itself, however, may be black on white if it is relatively

small in area. What must be avoided are severe contrasts in the major field of view (generally about 60 degrees surrounding the task—or 360 degrees if the worker constantly moves or looks about).

In the average industrial situation the employee works on dark materials such as metal, fabricating them on dark machines placed on dark, oily floors. If the plant is old, he may have 10 foot-candles or less of illumination—hardly enough to see clearly.

A new lighting system may be installed, possibly to deliver about 25 or 30 foot-candles. And to effect the most impressive light-meter readings, the walls may be painted white. The higher level of illumination will no doubt be welcome, but the white walls may promptly cause trouble.

It is not difficult to analyze the errors that might be made. If the white walls are showered with light, brightness ratios (in relation to materials, machines and floors) may jump way beyond 1 to 100. Various things will happen. The pupil of the eye may be constricted to reduce visibility of dark materials and machines. Vision may be blurred and real distress noted. Pupillary adjustments to the brightness of the wall (which is meaningless) will be accomplished in a matter of seconds. The dark materials and machines (which are important) will not be so easily fixated—the reverse action of seeing (from light to dark) being slow and time-consuming. It is easy to appreciate that the bodily reflexes of the worker may be retarded and his productive capacity cut down. And all despite more light and brighter surroundings.

It would be wrong, of course, to argue against higher levels of illumination. However, if they introduce glare and excessive brightness ratios, then it would be better to sacrifice a few extra foot-candles for a more uniform and comfortable seeing condition. However, other devices may be brought into play to effect good illumination as well as good seeing.

In the situation described above, the glare of white walls could be offset if other areas and surfaces in the interior were also lifted in brightness. If the floor were concrete, for example, it could be scrubbed and bleached out with a caustic solution. Machinery and equipment could be painted lighter. This would be "lifting" the matter of brightness from the bottom up—an excellent and recom-

mended practice. Yet if the floor were cedar block, oily and dark, the machinery color and the wall colors would have to be kept on the soft side.

Those who think in terms of illuminating efficiency are always campaigning for white and off-white colors on walls. Those who understand human vision and the psychological aspects of seeing will be inclined to favor fairly soft hues. And in my experience, greater justification would follow this latter viewpoint. Practically all experimental evidence has shown that a surrounding field *darker* than the brightness of the task is far superior to a lighter surround! The lighter surround will, in truth, tend to constrict the pupil and very seriously compete for attention. Thus, it is safer to be on the deep side than on the light side in almost any application of color. Yet the principle involved will generally irk the lighting specialist; he would rather look to his light meters than to the eyes of human beings.

It is quite possible to set forth ideal brightness specifications for factory and office conditions. Ceilings—almost without exception—should be white. This will be essential to the efficiency of indirect lighting systems. In direct systems, the white overhead will reduce contrasts between fixtures and their surroundings. Being "neutral," white will also attract less psychological notice and hence prove nondistracting.

Upper walls (generally to a line level with the bottom of roof beams or trusses) should have a reflectance between 50 and 60 per cent (if floors and equipment are on the dark side) or between 60 and 70 per cent if most areas and surfaces in the interior are or can be made fairly light. The contention is personal with me, but I oppose wall brightnesses higher than 70 per cent. I have tried them and failed with them. They seem to be allowable only where the most perfect and modern lighting system is installed and accompanied by pale floors and equipment—or for unimportant spaces such as storage where critical seeing tasks are not performed.

If a dado is required to conceal stains, the color tone should reflect not less than 25 per cent and perhaps not more than 40 per cent. Floors should reflect at least 25 per cent if such is practical. Machines, equipment, desks should have a reflectance factor be-

tween 25 and 40 per cent, lighter where the floor is light and deeper where the floor is dark.

These ratios and percentages have been successfully applied in numerous plants and thus have the benefit of widespread trial and research.

Certain refinements are also to be introduced. Window sash ought to be white or a light tint to lessen contrast without outside brightnesses. Machinery may be highlighted in accordance with the principles of Du Pont Three-Dimensional Seeing to reflect more light at important parts and concentrate the attention of the worker. In numerous fine-seeing tasks, background shields may be constructed (a) to reflect light and provide immediate contrast with materials, (b) to confine the vision of the worker and hold eye adjustments relatively stable, (c) to blank off shadows or movement in the distance, and (d) to give the worker a better sense of isolation. Normally such shields should cover from 45 degrees to 60 degrees of the visual field.

End-wall treatments in medium tones also have widespread application. Where most workers may be engaged at difficult eye tasks and may be so oriented as to face in the same direction, the wall ahead may be colored in a pleasing tint having a reflectance of from 25 to 40 per cent. The end wall will help to overcome an unfavorable constriction of the pupil. Upon glancing up, it will afford relaxation rather than the stimulation of glare. It will likewise relax the strain of prolonged convergence and be psychologically pleasing and restful. Here again is a principle widely and successfully employed in industry.

In the discussion so far presented it will be noted that chief emphasis has been placed on brightness rather than chromatic quality or color. Good illumination and well-balanced brightness ratios will be easy on the eyes whether the particular hues involved are pink or blue, yellow or green. Psychologically, however, color holds a fair amount of "magic," although any extravagant claims as to its therapy would be difficult to defend.

For industrial purposes, soft, delicately grayish hues are best. They are lacking in aggression, less distracting, and they most effectively conceal dust and soiling. Ordinarily, primitive colors such as blue and yellow are tiresome. Where subtlety exists

(bluish-green, peach, etc.) a more comfortable environment will be found and one that will "wear well" over prolonged periods.

It is logical to use "cool" colors such as green or blue where the working condition exposes the employee to relatively high temperatures. Conversely, "warm" tones of ivory, cream or peach are suitable to soften up a vaulty or chilly space and compensate for lack of natural light.

One very practical color will be found in a soft tone of blue-green. Given a reflectance factor between 50 and 60 per cent, it has universal possibilities for walls in factories, offices, schools, hospitals. It has an ideal brightness for average lighting conditions and will relieve glare as well as provide a neat sequence between light ceilings and average medium or deep tones on equipment and floors. Blue-green is a "cool" hue. It lacks monotony, having a bluish cast under daylight and a yellowish cast under artificial light. Best of all, it is the direct visual complement of human complexion. When the retina of the eye is saturated with it, a warm pinkish afterimage is produced which is flattering indeed to employees.

In working out color plans for industry, good colors (such as the above) and some amount of variety are recommended. Illumination and brightness should be supplemented by an intelligent consideration of color. Beauty becomes functional when it improves mental attitude and contributes to emotional and psychic gratification. It is futile to overlook psychological factors. Some authorities have been known to argue that nothing is wrong except that people are prejudiced. L. D. Morgan has stated, "As engineers we cannot shrug off complaints of bad lighting with the statement that the complaints are largely psychological. A patient or client with a psychosis suffers just as acutely as one with a physical injury." To the great credit of color is the fact that it appeals to all humans. It holds esthetic advantage and, added to good scientific practice in illumination and brightness engineering, it becomes the "crowning glory" of an intelligently and technically executed job.

In purely casual spaces, such as washrooms, rest rooms, cafeterias, lighter and cleaner hues may be used. In view of average color preferences, blue becomes ideal for facilities devoted to men, and rose for facilities devoted to women. In stairwells and corridors,

usually deprived of natural light, bright tones of yellow are effective. In storage areas, white is best and will make the most of existing lighting installations.

Where critical seeing tasks are performed, however, and where distractions are to be avoided, the best colors to use are soft variations of green, gray and blue. Large, vaulty spaces may be enlivened with ivory, cream or peach over all walls, or yellow over end walls. Gray machinery highlighted with buff on important parts and working areas will prove effective. Medium gray is also ideal for unimportant elements such as bins, racks, shelving. One must remember that color is more compelling than neutrality. Hence, if it is strategically applied, it can make order out of chaos, distinguish important from unimportant things, and help the worker in his mental effort to concentrate on his job. In theory as well as practice, the job of color is not so much to "pep" up the worker; too much of this attitude may lead to distractions and irrelevancies. To the contrary, color becomes integral with the task, not foreign to it. Improved efficiency and relief from fatigue become automatic because the human eye can see more easily, with less strain. Color is made to fit in rather than stand out. It contributes to better visibility and to an agreeable and cheerful frame of mind.

Finally, color serves a useful and functional purpose as a means of identification in safety practice. A well-integrated code, developed by the author in cooperation with Du Pont and later accepted in part by the American Standards Association, has the following features.

Yellow (or yellow and black bands) becomes standard to mark strike-against, stumbling or falling hazards. It is painted on obstructions, low beams, dead ends, the edges of platforms and pits. Being the color of highest visibility in the spectrum it is conspicuous under all lighting conditions and well adapted to the above purposes.

Orange is standard for acute hazards likely to cut, crush, burn or shock the worker. It is painted around the edges of cutting machines and rollers. On the inside areas of machine guards and electric switch boxes, it "shouts loudly" when such devices are removed or left open.

Green is standard to identify first-aid equipment, cabinets for stretchers, gas masks, medicines, and the like.

Red is reserved entirely and exclusively for the marking of fire protection devices. It is painted on walls back of extinguishers, on floors to prevent obstruction, on valves and fittings for hose connections.

Blue is standard as a caution signal. The railroad industry employs it to mark cars which should not be moved. In factories it is placed as a symbol on equipment, elevators, machines, tanks, ovens, etc., cut down for repair. It may be used on switch control boxes as a silent and unobtrusive reminder for the worker to see that his machine is clear before he operates it.

White, gray or black are standard for traffic control and good housekeeping. They are used for aisle marks, painted on waste receptacles. White corners and baseboards may be used to discourage littering and to get the sweeper to dig into corners.

Color in industry has achieved remarkable results. Its use has been forced by improvements in lighting, by machine operations involving fine tolerances, by labor shortages and the need to conserve human energy. It has economic aspects as well as social ones, for it protects human welfare, improves human efficiency, and adds dignity and order to the working environment.

Good vision demands ample light and proper brightness contrast. Illumination and color thus become one and the same thing—meaningless without each other, but potent in the conservation and direction of human energies when perfectly coordinated.

Public Responsibility for an Eye Health Program*

Franklin M. Foote, M.D.

THE author discusses some of the leading causes of blindness and points out the responsibilities of state and local health departments as well as other official agencies for promoting eye health and welfare.

AN old French recipe for rabbit stew begins, "First, catch your rabbit." Similarly, in undertaking a program for the prevention of unnecessary blindness, practicality demands, first, a definite and thorough understanding of the problem. Especially we need to know more about the incidence of blindness and about the relative importance of various causes in different geographic areas.

Responsibility for obtaining and tabulating data on causes of blindness would seem to fall properly on that department of government which is concerned with so many other vital data. In the states, cities, and counties of the United States of America, the department of health is required by law to collect statistics on births, stillbirths, deaths, and the causes thereof, and on a long list of communicable diseases. In at least two states these departments are now collecting statistics on the incidence and causes of cancer, and several states are collecting data on orthopedic crippling conditions of children. In regard to blindness, most of the states provide to some extent for education of blind children and for aid to the dependent blind of all ages. Yet few if any of these states have made an effort to determine the extent of the total problem or to discover the underlying reasons why people go blind.

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The task of studying the eye problem could be assigned to the local or state department of health, which has medical and statistical personnel experienced in dealing with the statistics of public health problems. These workers could collect and analyze, similarly, data relating to the causes of blindness.

Delay May Cause Blindness

When we talk about causes of blindness we usually refer to the medical causes, the part of the eye affected, and the etiology. There are other facts that must be considered if we are to develop a better basis for our attack against unnecessary blindness. We must find out why people go blind from senile cataracts; how many fail to seek medical care until complications have occurred which make it impossible for the eye surgeon to restore sight; how many go to a general practitioner or to a non-medical eye practitioner and are not referred to an ophthalmologist until too late.

In glaucoma, information is lacking as to the period between the time symptoms were first noticed and the time the patient saw his family physician or non-medical eye practitioner. What were the reasons for this delay? Had his community not informed him of the early symptoms of glaucoma and the need for prompt diagnosis? After the average patient seeks eye care, how much time elapses before he reaches the ophthalmologist? If there is a delay here, how is it explained? After patients are under ophthalmological care, how many continue faithfully under treatment, and what percentage lapse? If patients fail to remain under treatment, what is the reason? Is it because they have not understood the seriousness of the condition and the need of continued observation, or because of superstition, disbelief in the diagnosis, economic conditions, or what? Finally, we should learn what percentage become blind in spite of the best ophthalmological treatment.

A study along these lines of several hundred cases of glaucoma would reveal more clearly the various factors which cause so much unnecessary blindness from this condition. It would show what needs to be done most of all—whether the need is for better education of the public, of the general practitioner, or of the optometrist; or for better social service follow-up; or whether none of these is indicated. At present, we depend largely on the opinions of different

authorities and these are subject to the vivid impressions that may have been made by one or two recent and dramatic cases.

It should be possible in some city or state to enlist the cooperation of every medical practitioner in reporting voluntarily to a medical society committee each new case in which the vision becomes 20/200 or less, or in which the fields of vision are reduced to 20 degrees or less. It should be possible for the committee to have a medical statistician or a medical social worker obtain from the physician's records, the patient, and other sources, data related to the factors involved. In cases of eye accidents and in other conditions, different types of factors need to be studied. This would be a big task, but it would provide us with valuable information to guide us in planning intelligently to combat blindness.

Blindness in Children

So much for what we should like to know. Fortunately, we do not have to sit with completely folded hands. Drs. Velez of Mexico and Gomes and Alvaro of Brazil, among others, have reported on the causes of blindness in their countries. Dr. Conrad Berens, C. Edith Kerby, and others in the United States of America have provided us with considerable data on the medical diagnoses of blindness of children in schools for the blind and of dependent adults receiving aid. In children in the United States, for example, 13 per cent of the blindness is hereditary in origin and 42 per cent is due to congenital causes. We shall probably need much more information before we can offer sound advice for the reduction of blindness attributed to heredity. However, since Gregg and others have called attention to the relationship between the occurrence of rubella in the first trimester of pregnancy and congenital cataracts in the offspring, it is possible that in the not-too-distant future practical recommendations may be formulated for preventing blindness from this condition.

A great deal of the prevention of blindness work that is being done in the United States and in many other countries is an unrecognized by-product of the general public health movement. For example, efforts for the control of communicable diseases help to reduce blindness occurring as a sequel to many acute infections—which still accounts for 23 per cent of the children in schools for

the blind in the United States. Smallpox, which not uncommonly produces serious corneal scars, occasionally makes its reappearance even in the most highly civilized urban centers. Control activities against the syphilis meningococcus and against other causes of meningitis and encephalitis have helped also to decrease blindness.

Of even greater importance are public health measures designed to curb the transmission of venereal disease. Individual ophthalmologists as well as committees for the prevention of blindness should support the movement to educate the public about the dangers of syphilis and gonorrhea, emphasizing the need for early diagnosis and treatment, for epidemiological investigations to discover sources of infection, for nursing or social case follow-up to bring delinquent infective patients back under treatment, and for laws requiring physical examinations and laboratory tests before marriage as well as early in pregnancy. Such procedures, when conscientiously applied, are already showing results in lower incidence of interstitial keratitis in children. There already has been a 40 per cent decrease of this condition in the past ten years. Ophthalmia neonatorum has yielded to Credé's prophylaxis and, more recently, to sulfonamide and penicillin therapy. Although in 1907 ophthalmia neonatorum accounted for 28 per cent of those registered in schools for the blind in the United States, by the school year 1945–1946 it had decreased to 3 per cent among new admissions.

It is ironic that the very efficiency of health departments which has resulted in prolonging the average span of life from forty to sixty or seventy years has brought about an increasing amount of blindness and eye problems. For it is during the period of life after forty that glaucoma, cataract and other serious eye difficulties usually arise. In addition, the great advances made by pediatricians and hospitals in caring for premature infants have saved the lives of many babies that formerly would have been lost. With the increasing number of surviving premature infants, there has been recognized the blinding eye condition, retrolental fibroplasia, attributed to immature development of the vitreous. It has become painfully apparent, then, that making progress in one health field often brings to light or even creates problems in other fields.

Eye Problems in Adults

Because of our aging population, it is especially pertinent that we stress the eye problems of adults. According to the United States Census, in 1900 one-sixth of the population was in the group, 45 years and over—the age group in which glaucoma becomes important. In the year 1960, it is anticipated, twice as many, or one-third the population, will be in the glaucoma age group. Likewise, the proportion of persons over 65 years who are most subject to cataracts is rising from one-twenty-fifth of the population in 1900, to one-tenth the population in 1960, a 250 per cent increase. The eye problems of older people, therefore, are becoming more common.

Departments of health already are turning their attention to some of the diseases of adult life such as cancer, heart disease, and diabetes. It is our responsibility to remind them also that cataract and glaucoma account for 23 per cent and 11 per cent, respectively, of those receiving Aid-to-the-Needy-Blind in the United States. In the course of a community health program, health departments can contribute much in case-finding and in the dissemination of information. There are still many of the laity who believe that a cataract is a growth across the front of the eye, and operation may mean "taking the eye out and scraping off the cataract," and that "the right kind of drops will dissolve the cataract and restore sight." Ignorance and false hope produce delays. When at long last the family and the patient acknowledge that surgery is indicated, only too often the ophthalmologist finds that uveitis has developed, the iris is adherent to the lens, the cataract hypermature, or the patient not in good physical condition. An ethically directed and continuing educational program will help to decrease delays from these causes, bringing the patient to the surgeon earlier and in better health.

Cataract patients may be encountered by alert public health nurses in the course of their routine home visits, and thus may be referred for medical attention. Other case-finding measures seem to be worth while for glaucoma. In the city of Philadelphia brief eye examinations for signs of glaucoma were made on three thousand persons employed by several department stores and insurance companies. This examination included tonometry and ophthalmo-

scopic examination. All suspects were referred to private ophthalmologists or to eye clinics, depending upon economic status. Although exact statistics have not yet been released, the number of combined diagnosed cases is most impressive and certainly would indicate repeating this procedure elsewhere. This kind of case-finding is indeed fruitful, since most patients are being discovered in the earliest stages of glaucoma when there is little or no loss of fields of vision. It will be interesting to follow the results of the Philadelphia investigation.

Accidents

Prevention of blindness caused by accidental injuries will require constant education as well as the enforcement of regulations. In children, 7 per cent of those in schools for the blind are there from this cause. Laws concerning the sale of fireworks and of air rifles (BB guns) tend to reduce some of these causes, but every propaganda device available should be used to point out the dangers from pointed instruments, slingshots, and bows and arrows in children's hands. Among the adult blind in the United States receiving public aid, 13 per cent lost their sight from accidents, of which about one-half occurred in the course of their occupations. Enforcement of rules requiring the wearing of goggles in hazardous jobs would seem to be the easy answer here; but, again, education is needed to persuade the worker to wear the safety glasses provided by his employer.

School Problems

The promotion of eye consciousness accounts for our great interest in the eyes of young children. We realize that the human eye can stand a great deal of misuse under poor lighting conditions and that eyes with refractive errors do not necessarily develop organic changes even though they may become fatigued. However, it is important, in young children, to discover early those with strabismus in order to prevent *amblyopia ex anopsia*. Educational authorities are concerned with children's vision because 83 per cent of learning comes through the eye. Finding children with refractive errors and getting them corrected make it possible for the child to benefit most from his schooling. Even after correction a few chil-

dren may have vision of 20/70 or worse; for these children "sight-saving" classes are being provided, enabling them to acquire as good an education as those without visual handicaps.

We who are interested in prevention of blindness gain from this concern of educators about children's eyes, because through the child we can reach back into the whole family. Every time a child reports to his father or mother that the school authorities have checked his vision or advised eye care, his parents are reminded of the importance of this sense organ. The mother and father may become conscious of early symptoms of eye trouble in themselves and be stimulated into seeking ophthalmological attention. Thus, through the schools as well as through industry it is possible to create a greater awareness of the need for proper eye care.

In recent years the National Society for Prevention of Blindness has been besieged by inquiries relating to the proper method of testing children's eyes as a basis for selecting those needing referral to the specialist. Ideally, it would be desirable to have every child given a complete eye examination before entering school. Even if this might be economically feasible there is doubt that the ophthalmologists available would have the time to handle this load. Questions have arisen as to what kind of preliminary testing should be done by the classroom teacher or by the school nurse. There have been arguments as to the relative value of a battery of tests compared with simply checking visual acuity for distance. Some have questioned the practicability of testing large numbers of children under eight or nine years of age. In an effort to throw light on some of these problems, the National Society and the U. S. Children's Bureau are financing a study of vision testing methods in the city of St. Louis, Missouri. It will take a year to give 1,200 school children all the tests that are to be evaluated and to have the ophthalmological examinations made through the cooperation of the Washington University Eye Clinics. The results will have considerable significance and will undoubtedly indicate a practical testing program for elementary school children.

Prevention a Cooperative Effort

Mention has been made of the many opportunities that city, county and state health departments have to contribute to the

campaign against unnecessary blindness as a part of their work in collecting statistics, in controlling communicable disease, in industrial hygiene, in health education, and in child health activities. It is the responsibility of a lay citizens' society like ours, with the guidance of the ophthalmological profession to point out and demonstrate these opportunities to health officials. In accordance with this reasoning, we coordinate our work on eye problems with the U. S. Public Health Service, the U. S. Children's Bureau, the U. S. Office of Education, the Office of Vocational Rehabilitation, the Bureau of Public Assistance in the Federal Security Agency, and other governmental groups. We believe we should keep closely in touch with other citizen groups such as the National Health Council, of which our Society is a member agency, the National Congress of Parents and Teachers, and such professional organizations as the American Medical Association, the three national ophthalmological societies, the American Public Health Association, and the National Education Association.

We of the United States gain much by meeting with representatives of prevention work in our neighboring countries of the Americas, learning of scientific developments and of practical ways of reducing the needless loss of sight. We look forward to further discussion of our mutual problems. Undoubtedly the International Association for Prevention of Blindness will find it profitable to have a regional office in the Western Hemisphere in order to be more closely in touch with activities in the youthful Americas.

Prevention of blindness is a big problem that can be tackled successfully only on a broad front. Not only eye specialists, but also educators, public health and social workers and lay citizens all have important parts to play. We must make every effort to enlist their active participation in our program.

A Bibliography on Handwork, for Teachers of Partially Seeing Children

Margaret J. Hittell

THIS bibliography is intended to be used as a continuation of the National Society's publication 312, "Motivated Handwork and Activity Units in Sight-Saving Classes," by Sarah Latimer Phelps.

Introduction

Handwork in education can probably be traced back to the days of Plato who realized that training the hand is a means of developing the mind. Pestalozzi, Herbart and Froebel stressed the introduction of practical handwork into the educational program. Not until recent years, however, has the value of craft work to boys and girls as well as to adults been recognized.

Modern educational programs emphasize those experiences which the child will encounter in society when he grows up. Getting along with one's fellow beings is very necessary in our present complex society. What better way to train children along this path can be found than to give a group of boys and girls the opportunity to work together on a project of mutual interest? Their shared ideas, plans, and performances show that cooperation can be achieved early in their lives.

Important, too, is the use of leisure time. When successful units are being undertaken in school, children will often find pertinent material either in their homes or in the community.

Handwork must have its rightful place in the school program; not only does it stimulate children's creative abilities, but it also gives children a chance to display their talents. For these reasons, handwork plays an important rôle in the educational program of all school children, especially the partially seeing.

Bibliography

The following annotated bibliography of books on handicraft has been prepared especially for use of teachers of partially seeing school children.

Ackley, Edith Flack. *Holiday Cards for You to Make.* New York: Frederick A. Stokes Co., 1940.

This very attractive book is devoted entirely to the making of greetings for special occasions. The little rhymes could be typed on the greetings with a bulletin typewriter.

Boy Scouts of America. *Metalcraft Methods Booklet.* New York: Boy Scouts of America, 1940.

Just a wooden hammer and a saw are all the tools necessary to make simple projects with a dull metal finish. The trays, bowls, and bracelets could be made very easily.

Bufano, Remo. *Be a Puppet Showman.* New York: The Century Co., 1933.

Remo Bufano describes the making of marionettes, stages, and equipment in a very clear way. He tells the history of puppet making as well as his own personal introduction to marionettes.

Bufano, Remo. *Magic Strings.* New York: Macmillan Co., 1939.

Eleven plays selected exclusively for marionettes. Notes are given at the end of each play to aid in the making and the performance of the characters.

Cole, Natalie Robinson. *The Arts in the Classroom.* New York: John Day Co., 1940.

Here is a book on the theory of creative painting, clay work, and writing. We can better understand and appreciate our children's work after we read this.

Cox, Doris, and Weismann, Barbara Warren. *Creative Hands.* New York: John Wiley and Sons, Inc., 1945.

An introduction to craft techniques. Old table mats and shortening cans covered with wallpaper serve many useful purposes. Modeling with dough instead of clay is described in chapter sixteen.

Dodds, Robert E. *Handicrafts as a Hobby.* New York: Harper and Brothers, 1939.

Some of the projects in this book have been worked out by students in grade schools. The suggestions for strip confetti will be quite helpful.

Fling, Helen. *Ventriloquism.* New York: Treasure Chest Publications Inc., 1938.

Describes the making of a ventriloquist dummy from start to finish. How to throw the voice in the art of ventriloquism is carefully explained along with sample dialogues.

Gaba, Lester. *On Soap Sculpture.* New York: Henry Holt and Co., 1935.

Pointers for beginners in soap carving. Activities with soap might include a zoo with some of its animals or a unit on transportation. Soap has also been recommended for the heads of marionettes.

Girl Scouts of America. *Arts and Crafts with Inexpensive Materials.* New York: Girl Scouts of America, 1941.

Work with finger painting, marbled papers, marionettes, puppets, and clay are reviewed here. Other crafts that can be tried in the sight-saving class are tie dyeing, candle making, and shell painting.

Glantz, Evelyn. *Scrap Fun for Everyone.* New York: Larch Book Co., 1944.

Several hundred ideas to try from scraps. Most of them require just a few steps to complete.

Green, Dana Saintsbury. *Masks and Puppets.* New York: Studio Publications, Inc., 1942.

Glove puppets, string puppets, stuffed marionettes, and jointed wooden marionettes are discussed separately. The many illustrations of faces and hands for them are excellent.

Hall, Ruth Mason, and Hall, A. Neeley. *Home Handicraft for Girls.* New York: J. B. Lippincott Co., 1941.

All girls will want to try to make the simple bedroom rugs and macaroni jewelry suggested in this book. Directions are given for

making paper coasters, party decorations, small lily ponds, gift wrappings, large silhouettes, cotton snow men, and many other very helpful ideas.

Haslam, Fred. *Simple Wooden Toys.* New York: The Studio, 1945.

Young children will enjoy playing with the wooden tiles illustrated in this book. A Scottie on wheels, a sailing boat, and a locomotive are included.

Hellum, Amanda W., and Gottshall, Franklin H. *You Can Whittle and Carve.* Milwaukee: Bruce Publishing Co., 1942.

Nearsighted children like to try wood carving. Directions, diagrams, and finished views are shown for many of the objects.

Holmes, Ruth Vickery. *Model—Theatre Craft.* New York: Frederick A. Stokes Co., 1940.

A different kind of actor is introduced here. He is made of pipe cleaners and between scenes his figure can be bent to assume a different position from that in the last scene. Costumes, scenery, and appropriate plays accompany the directions for his construction.

Horth, Lillie B., and Horth, Arthur C. *101 Things for Girls to Do.* New York: J. B. Lippincott Co., 1946, sixth ed., revised.

Older girls would enjoy making the simple recipes in this book. Some might enjoy the winter flower decorations, decorative dyeing, beaded napkin rings, and wool balls.

Horth, Lillie B., and Horth, Arthur C. *101 Things for Little Folks to Do.* New York: J. B. Lippincott Co., 1936.

The basic steps in modeling with plasticine are included in this book, along with an easy method of making homes and buildings for a plasticine village. Empty ice cream cartons and pieces of cardboard can be camouflaged in clever ways described in this book.

Hunt, Walter Bernard. *Ben Hunt's Whittling Book.* Milwaukee: Bruce Publishing Co., 1944.

Introduces wood carving to a beginner. A common pocketknife and a piece of wood is all one needs to start. A toy duck or penguin might be the first project.

Ickis, Marguerite. *Arts and Crafts.* New York: A. S. Barnes and Co., Inc., 1943.

A practical handbook for beginners in handicrafts. The chapters on paper craft and puppetry meet our needs. The puppets made from paper bags and rubber balls would delight any child.

Jordan, Nina R. *Holiday Handicraft.* New York: Harcourt, Brace and Co., 1938.

This book is the solution to every teacher's problem of new ideas for holiday material. The large, clear illustrations are extremely helpful. Excellent suggestions for each of 15 holidays make this book ideal for sight-saving teachers. The type is fairly large too.

Jordan, Nina R. *Mother Goose Handicraft.* New York: Harcourt, Brace and Co., 1945.

Most youngsters enjoy Mother Goose stories. What an extra delight we can give partially seeing children by letting them make some of the characters in these rhymes. Though some of the figures would have to be simplified, the cupboard from "Old Mother Hubbard," the moon in "Hey, Diddle, Diddle," the clock in "Hickory, Dickory, Dock," and the boat in "Bobby Shafto" can be made by the very youngest members of the class.

Kosloff, Albert. *Elementary Plastics Processes.* Chicago: Waller High School, 1942.

A rather technical explanation of plastics, but the serving trays, coasters, rings, and bracelets could be attempted.

Lee, Tina. *What to Do Now.* New York: Doubleday and Co., Inc., 1946.

A lovely book, attractively illustrated, full of new things to do with egg boxes, bottles, colored salt, and paper boxes. The clever projects for Christmas, Valentine's Day, and several other holidays are near the back of the book.

Leeming, Joseph. *Fun with Clay.* New York: J. B. Lippincott Co., 1944.

A book for beginners in clay work. Materials, methods, and proper storage of clay are discussed. Eskimo igloos, log cabins, and Indian pueblos can be used in social studies units.

Leeming, Joseph. *Fun with Leather.* New York: Frederick A. Stokes Co., 1941.

Leather work may prove to be quite expensive. However, with holes punched around the edges and narrow strips of leather laced through the holes, lovely table mats, desk pads, bookmarks, and slippers can be made without much expense or eyestrain.

Leeming, Joseph. *Fun with Paper.* New York: Frederick A. Stokes Co., 1939.

Just full of new ideas for objects that can be made from paper. These are included in the following groups: paper folding and cutting, paper toys and games, useful articles, paper puzzles, and paper magic.

Leeming, Joseph. *Fun with Plastics.* New York: J. B. Lippincott Co., 1946.

Good for beginning work in plastics. The rich, bright colors of plastics need no polishing and thus glare is reduced. With the aid of a coping saw many useful articles such as paperweights, bracelets, napkin rings, window shade pulls, puzzles, coasters, and trays can be made.

Leeming, Joseph. *Fun with Wood.* New York: Frederick A. Stokes Co., 1942.

Silhouette profiles in wood of members of the class will solve the problem of what to make for Mother's Day. Photograph frames, broom holders, and paper knives might be tried by beginners.

Leeming, Joseph. *More Things Any Boy Can Make.* New York: D. Appleton-Century Co., 1936.

Easy toys and games girls as well as boys might like to make. The peanut puppets, pen and pencil holders, pinwheels, and clothes-pin animals are but a few of the many delightful projects described.

Leeming, Joseph. *Toy Boats to Make at Home.* New York: D. Appleton-Century Co., Inc., 1946.

Most of these boats can be made with a knife, a plane, and some sandpaper. The part of the book dealing with small craft explains

how simple boats can be made from pea-pods, paper, egg shells, nutshells, or corks.

Marran, Ray J. *Playthings for Indoor and Outdoor Fun.* New York: D. Appleton-Century Co., Inc., 1940.

Some easily made toys as water floats, Indian wind-paddles, and bird-shaped kites are illustrated. A sample bookrest, similar to one type used in the sight-saving class, is also shown.

Martin, Philip L. *Animals for You to Make.* New York: J. B. Lippincott Co., 1944.

Large, heavily-outlined drawings of animals to be made from wood. Backgrounds for the different types of animals in addition to suitable colors are suggested.

Mason, J. Leonard. *Sand Craft.* Cambridge, Mass.: J. L. Hammett Co., 1937.

The problem of what to make next on that sand table is sometimes perplexing. Sight-saving teachers will appreciate the illustrated projects and the suggestions for making these projects appear realistic.

McPharlin, Paul. *Paper Sculpture.* New York: Marquardt and Co., Inc., 1944.

Paper sculpture is a comparatively new vogue. Though many of the ideas are for store display windows, Mr. McPharlin suggests that simple subjects should be tried with young children. The Christmas tree ornaments or the paper puppets might be a good introduction to the enjoyment of paper sculpture.

Newkirk, Louis V. *Integrated Handwork for Elementary Schools.* New York: Silver Burdett Co., 1940.

An excellent reference tool explaining the place of handwork in teaching procedures. The author also describes and illustrates various handwork techniques which we can apply to our work.

Newkirk, Louis V., and Zutter, La Vada. *You Can Make It.* New York: Silver Burdett Co., 1944.

So many interesting things can be done with paper. Most of the articles can be made with just the aid of scissors, paste, and paints.

Parkhill, Martha, and Spaeth, Dorothy. *It's Fun to Make Things.* New York: A. S. Barnes and Co., 1941.

Painted place mats, plates, wastebaskets, and coasters of paper are seen everywhere these days. What fun it would be to make a matching set of these objects simply by following the directions in chapter one! The Indian signs and their legends on pages 110 and 111 make lovely designs for clay pottery.

Payant, Felix, ed. *A Book of Puppetry.* Columbus: Design Pub. Co., 1936.

A group of illustrated articles showing how various schools and companies have constructed puppets for plays, displays, and advertisements.

Payant, Felix. *Create Something.* Columbus: Design Pub. Co., 1939.

The author discusses each type of creative craft in a separate chapter. The photographs show children and adults illustrating the work he describes. Chalk drawing, mask making, puppetry, paper construction, and many other topics are valuable.

Perry, Evadna Kraus. *Crafts for Fun.* New York: William Morrow and Co., 1940.

It has been just recently that sheet cork has come into use for decorative purposes. Auto supply stores can furnish sheets of various thicknesses. Many ideas for using sheet cork have been presented by the author. The chapter on spattering supplies good material for gifts and gift wrapping paper.

Powers, Margaret. *A Book of Little Crafts.* Peoria: Manual Arts Press, 1942.

Forty projects for experimenting with color and design, shapes, sound, and dramatics. Almost every one can be done in the sight-saving class. Each project is illustrated in a full-page drawing.

Reynolds, Harry Atwood. *Complete Book of Modern Crafts.* New York: World Publishing Co., 1946.

Clay, plaster, pottery, leather, metal, celluloid, paper crafts, lampshade making, block printing, stencilling, crayon crafts, furniture painting, china painting, soap carving, wood carving. A number of inexpensive things to make. Includes information as to where materials may be bought.

Robinson, Jesse. *Things to Make from Odds and Ends.* New York: D. Appleton-Century Co., Inc., 1945.

Just full of new ideas to try. The newspaper zoo and small doll are so easy to make. The hat-pin holders, flower pots, and necklaces made from spools are fun too.

Rossbach, Charles Edmund. *Making Marionettes.* New York: Harcourt, Brace and Co., 1938.

The making of a marionette, from the time it is still just an idea to the moment it is ready to take a bow on the stage, is very carefully explained. Included also, are three plays for the finished puppets.

Showalter, Hazel F. *Small Creations for Your Tools.* Milwaukee: Bruce Publishing Co., 1942.

The novelties in this book are planned to make use of inexpensive materials such as tin cans, spools, clothespins, coconut shells, and scraps of wood. Spools and coconut shells have many unique uses. Each project is illustrated.

Stratton, Mary Chase. *Ceramic Processes.* Detroit: Powabic Pottery, 1941.

Teachers will find this book valuable in that it describes three methods of clay construction—coil, strips, and profile. The simple shapes of the ancient vases illustrated in the beginning of the book could be made during a unit on early civilizations.

Stricker, W. L. *Projects through Crafts.* Toronto: Ryerson Press, 1941.

Projects of special interest for pupils in grades one and two. The directions for paper folding, paper cutting, seasonal activities, and other work are given as though the teacher were talking to the child.

Thach, Stephen D. *Finger Painting as a Hobby.* New York: Harper and Brothers, 1937.

A good book for one unfamiliar with finger painting. The history, purpose, procedures, and processes of finger painting are discussed in detail.

Tilson, Agnes. *Homemade Toys and Play Equipment.* St. Paul: Farmer's Wife Magazine, 1937.

Many of these items of play equipment can be made in school and enjoyed by all those who constructed them.

Tomlinson, Reginald R. *Crafts for Children.* New York: Studio Publications Inc., 1935.

A book for those who would like to know the principles and methods of craft work. Craft teaching today and craft teaching in other lands are discussed. The illustrations throughout the book show samples of craft work done by children in several European countries and the United States.

Turpin, Lawry. *Toys You Can Make of Wood.* New York: Greenberg, Inc., 1944.

Tops, jumping jacks, games, and animals from the zoo and the circus delight young children. More difficult toys are included too.

U. S. Children's Bureau. *Toys in Wartime.* U. S. Department of Labor, 1942.

This pamphlet describes simple toys made from substitute materials. The ideas are good today and now we can probably use rubber, steel, or plastics in some of the items.

Zarchy, Harry. *Let's Make More Things.* New York: Alfred A. Knopf, 1943.

This second book by the author adds more craft projects that children will love to make. The simple illustrations and easy-to-read directions make these two books by Mr. Zarchy a "must" for every sight-saving teacher.

Zarchy, Harry. *Let's Make Something.* New York: Alfred A. Knopf, 1941.

The first section gives directions for making paste, papier mache, glue, and plaster. The crafts are made from wood, paper, glass, clay, plaster, soap, and wax and are cleverly written in this appealing book.

Zutter, La Vada. *Spatter Ink Technique.* New York: Sanford Manufacturing Co., 1938.

Spattering of paper plates, hat boxes, ice cream containers, and lampshades are just a few of the many ideas presented. Freehand cutting of the shapes to be used as stencils is advised.

Note and Comment

National Society's 1948 Conference.—Preliminary programs have already been sent announcing the topics to be discussed during the forthcoming Conference of the National Society for the Prevention of Blindness, in Minneapolis, Minnesota, April 5, 6, and 7, 1948. Among the subjects scheduled are: "Public Health Responsibility for Eye Health"; "Vision in Education"; "Organizing the Community for Sight Conservation"; "Teamwork for Industrial Eye Care"; "Scientific Advances in Prevention of Blindness"; "Education of the Exceptional Child."

There will be a luncheon meeting at which Mr. Amos S. Deinard, President of the Minnesota Society for the Prevention of Blindness, will speak on "The Rôle of a Board Member in a Voluntary Health Agency"; the dinner meeting at which Dr. Haven Emerson, Emeritus Professor of Public Health Practice, College of Physicians and Surgeons, Columbia University, will discuss "Sight Conservation in the Local Health Program"; and a luncheon meeting at which reports will be heard from international delegates.

In addition to leading authorities in every phase of sight conservation and public health, the Conference will have as speakers outstanding civic figures, among them the Hon. Luther W. Youngdahl, Governor of the State of Minnesota; the Hon. Hubert Humphrey, Mayor of the City of Minneapolis; Dr. A. J. Chesley, Secretary and Executive Officer, Minnesota Department of Health; Dean M. Schweickhard, Commissioner of Education, State of Minnesota; and Mason H. Bigelow, President, National Society for the Prevention of Blindness. A large and representative group of conferees is expected, and reservations for the luncheons and dinner meeting are being received.

Report on Retinitis Pigmentosa.—Speaking before the members of the American Academy of Ophthalmology and Otolaryngology, meeting in Chicago, in October, 1947, Dr. Dan M. Gordon of New York City reported on the results of treatment of retinitis pigmentosa by the "Russian Method." He said that there was

apparent "improvement" (the quotation marks he uses whenever he speaks of improvement) in 33 per cent of all cases treated. "On the surface," he says, "this would seem to be a very optimistic report for the treatment of a hopeless disease. Actually, no such optimism is intended or shown by a detailed analysis of our records or confirmed by observation of the patients themselves."

Of the 128 patients treated, 34 are recorded as having shown an "improvement" in vision in at least one eye. This "improvement" varied from counting fingers held before the eye, to recognizing the large letters on the test chart and, in one case, to reading three more lines on the chart with one eye than in the pretreatment examination. Some could also see a little farther out to the side (enlarged field of vision). A few seemed to have slight "improvement" in their dark adaptation. Three patients had a marked loss in vision while under treatment.

Summarizing, Dr. Gordon said, "The actual fact is that it is very difficult to explain or to interpret these results. Every one of the tests employed is, to some degree, subjective. The problem would be a much simpler one if we could observe ophthalmoscopic evidence of 'improvement.' No changes in the fundi were expected or observed. These patients are capable of tremendous psychic outbursts with increased retinal function as a resultant. Many of them can be temporarily improved by large doses of nicotinic acid or other vasodilators. We are not in a position to state just how long certain patients are capable of reacting to such stimuli, chemical or mental, and whether such sustained reactions are harmful.

"Some of the patients had paradoxical results with improvements in one eye and regressions in the other. Certainly, such incidences are confusing and impossible to explain as are the three patients who suffered marked visual losses while under treatment.

"Too often, in the past, our hopes have been aroused unnecessarily by new 'retinitis pigmentosa cures' to chance another such disillusioning experience. It would be a mistake of the first order for our readers to rush back to their offices and summon in all of their retinitis pigmentosa cases for this new treatment until much more is known about its merit, length of duration of the improvements if such they are, and ability to maintain such improvements. It would be a tragedy to arouse any enthusiasm in either the patient

or the doctor until these questions can be accurately answered. Certainly, from our results to date, this method would seem of very little, if any, practical value."

Research Fellowships Granted.—Fellowships for research in ophthalmology have been granted to the medical schools of Harvard and Yale Universities by The Eye-Bank for Sight Restoration, Inc. Recipients of the fellowships will devote themselves chiefly to problems related to the cornea. It is expected that the knowledge thus acquired will aid in the conservation of vision and the restoration of sight among thousands of individuals. One of the principal objectives of research carried on at the present time is the discovery of a method for the preservation of corneal tissue for a period longer than 72 hours.

One fellowship was awarded to Dr. Thomas Duane, for work at the Howe Laboratory of Harvard University Medical School to investigate the metabolism of the cornea under various conditions of storage, to determine what basically takes place which deleteriously affects corneal tissue and makes it unsuitable for corneal transplant. The other grant went to Dr. David Freeman, for work at the Yale University School of Medicine, whose problem it will be to attempt to determine whether embryonic tissues can be grafted upon members of the same species and upon other species. This is an experiment in tissue transplantation.

In the past years fellowships have also been granted by The Eye-Bank to Johns Hopkins University, for research at the Wilmer Institute there, and to New York University.

***Saturday Evening Post* to Publish Article on Glaucoma.**—Readers of the REVIEW will undoubtedly be interested in an article on the glaucoma problem, scheduled to appear in the March 20, 1948, issue of the *Saturday Evening Post.* The article, entitled "They Don't Have to Go Blind," was written by Steven M. Spencer, science editor of the *Post,* and describes, among other things, the glaucoma study made under the sponsorship of the Philadelphia Committee for Prevention of Blindness.

Book Review

Briefer Comment

RESEARCHES ON NORMAL AND DEFECTIVE COLOUR VISION, W. D. Wright. St. Louis: The C. V. Mosby Company, 1946. 383 p. ill.

This volume is divided into eight sections: Part I introduces the reader to the visual organs and processes and to visual perception; Part 2 describes the colorimetric equipment used in the experimental studies; Parts 3 through 7 deal with research on luminosity, color mixture, sensory discrimination, adaptation and defective color vision; and Part 8 discusses the rôle of the fundamental response curves in visual theory.

Dr. Wright makes an outstanding contribution to the literature of color vision in this book, for in it he has collected and rewritten reports of the past 20 years work in this field, at the Imperial College, London. The investigations date from 1926, when the Medical Research Council first awarded a grant for experiments on the redetermination of the spectral mixture-curves. The special colorimeter designed for this work has been useful ever since in dealing with the problems of color vision that are reported.

This book should be useful to all workers who have any interest in problems of color vision.

Contributors to This Issue

Long recognized as a public health leader, **C.-E. A. Winslow, D.P.H.,** New Haven, Conn., is editor of the *American Journal of Public Health.*

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Eunice W. Wilson is Director of Social Service, Massachusetts Eye & Ear Infirmary, Boston, Mass.

Faber Birren, of Faber Birren and Company, New York City, a specialist in industrial color specifications, has written extensively on the use of color in industry.

Franklin M. Foote, M.D., D.P.H., executive director of the National Society for the Prevention of Blindness, brings to it a wealth of public health experience.

Margaret J. Hittell is a teacher of the partially seeing at the Garber-Horne School, Allentown, Pennsylvania.

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